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Applicant's or agent's file reference 04372/142	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).	
International Application No. PCT/NZ2003/000159	International Filing Date (day/month/year) 22 July 2003	Priority Date (day/month/year) 22 July 2002
International Patent Classification (IPC) or national classification and IPC Int. Cl. <sup>7</sup> C22B 9/14, 34/12, C22C 1/00		
Applicant TITANOX DEVELOPMENT LIMITED et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.  
☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheet(s).

3. This report contains indications relating to the following items:

- |      |                                     |   |
|------|-------------------------------------|---|
| I    | <input checked="" type="checkbox"/> | Basis of the report   |
| II   | <input type="checkbox"/>            | Priority  |
| III  | <input type="checkbox"/>            | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| IV   | <input type="checkbox"/>            | Lack of unity of invention  |
| V    | <input checked="" type="checkbox"/> | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| VI   | <input type="checkbox"/>            | Certain documents cited   |
| VII  | <input type="checkbox"/>            | Certain defects in the international application  |
| VIII | <input checked="" type="checkbox"/> | Certain observations on the international application   |

Date of submission of the demand 18 December 2003	Date of completion of the report 16 December 2004
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer  <b>MATTHEW FRANCIS</b> Telephone No. (02) 6283 2424

**I. Basis of the report****1. With regard to the elements of the international application:\***

- ☐ the international application as originally filed.
- ☒ the description, pages 1-13, 15, 16, as originally filed,  
pages , filed with the demand,  
pages 14, received on 24 May 2004 with the letter of 24 May 2004
- ☒ the claims, pages 18, 19, as originally filed,  
pages , as amended (together with any statement) under Article 19,  
pages , filed with the demand,  
pages 17, received on 24 May 2004 with the letter of 24 May 2004
- ☒ the drawings, pages 1, as originally filed,  
pages , filed with the demand,  
pages , received on with the letter of
- ☐ the sequence listing part of the description:  
pages , as originally filed  
pages , filed with the demand  
pages , received on with the letter of

**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:**

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

**4. ☐ The amendments have resulted in the cancellation of:**

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.

**5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\***

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims 1-25	YES
	Claims	NO
Inventive step (IS)	Claims 1-25	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-25	YES
	Claims	NO

**2. Citations and explanations (Rule 70.7)**

D1: WO 2001/007672

D2: US 3840364

D3: US 3537695

D4: PERRY'S CHEMICAL ENGINEERS' HANDBOOK

**NOVELTY (N)**

Claims 1-25: None of the cited art discloses the invention as presently claimed. D1, D2 and D3 relate to separation of components of alloys and do not relate to the metal based composites of the invention. D4 discloses separation processes that involve particle enlargement by processes such as agglomeration. D4 does not teach the invention as claimed.

**INVENTIVE STEP (IS)**

Claims 1, 4-12, 14-25: D4 teaches that it is known to use size enlargement in processes of separation. These techniques appear to be of general application and would be easy to adapt to the field of metal based composites. However, D4 discloses the use of heat treatment to cause such enlargement only after the crushing process. By contrast, the claims require that the composite be heat treated before the crushing step. This is not disclosed or suggested by the prior art. Hence these claims are considered to involve an inventive step.

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

1. Claim 11 is not clear in so far as it is appended to claims other than claim 10. The claims other than claim 10 do not contain any antecedent for "the metallic phases, intermetallic phases and oxides".
2. Claim 24 is not clear in that it contains the words "more preferably" and it is not apparent how the feature, so qualified, affects the scope of the claim.
3. The text, at page 4 line 13, appears to be incomplete. The formula " $\text{Ti}_3\text{Al}$ " should probably read " $\text{Ti}_3\text{Al}(\text{O})$ ".

Revised by  
Article 34

bottom of the column is also taken out of the column and filtered. The powder produced from the sediment is called the B2 powder. B1 powder, which accounts for typically 30-50% of the total starting powder, contains 20-40%  $\text{Al}_2\text{O}_3$ . B2 powder, which accounts for typically 50-70% of the total starting powder contains 70-85%  $\text{Al}_2\text{O}_3$ . B1 powder has a particle size typically in the range of 0.5-10  $\mu\text{m}$ , while the B2 powder has a particle size typically in the range of 5-100  $\mu\text{m}$ .

**Step 6: Further separation of low  $\text{Al}_2\text{O}_3$  powders**

B1 powder is compacted by using mechanical press and the material goes through step 1 to step 5 again to produce B3 and B4 powders. B3 powder is from the suspension and contains a lower volume fraction of  $\text{Al}_2\text{O}_3$  than the B1 powder. The volume fraction of  $\text{Al}_2\text{O}_3$  articles in the B3 powder is in the range of 15-25%. B4 is the by-product of the process. B1 to B4 powders are all valuable in their own right.

Steps 1 to 5 may be repeated more than once to produce B5 and B6 or further refined powders.

**Step 6a: Extraction of titanium rich powder from suspension**

The B1 or B3 powder produced from step 5 is mixed with surfactant and water to produce a suspension with a solid concentration of approximately 10 g /litre. The titanium rich powder is then extracted from the suspension by using either a method of electrophoresis or magnetic separation.

**Step 7: Addition of calcium hydride to reduce the oxygen content in the titanium rich powder**

Once the volume fraction of the  $\text{Al}_2\text{O}_3$  in the  $\text{Ti}_x\text{Al}_y(\text{O})$  rich powder has been reduced to below 30% the powder can then be mixed with calcium hydride and heated to 800°C to facilitate the reaction between  $\text{Al}_2\text{O}_3$  and calcium hydride to eliminate  $\text{Al}_2\text{O}_3$ , and between  $\text{Ti}_x\text{Al}_y(\text{O})$  and calcium hydride to reduce the oxygen content in the  $\text{Ti}_x\text{Al}_y(\text{O})$  phase to below 1.5 atomic percent. As a by product of the reaction, the CaO and  $3\text{CaO} \cdot \text{Al}_2\text{O}_3$  phase can then be leached out by using mild acids such as formic and acetic acids.

# CLAIMS

1. A method of separating a component from a metal based composite, the method including the steps of increasing the size of a component and separating the increased sized component from the other components of the composite.
2. The method according to claim 1 wherein the metal based composite is heated to a temperature of between about 1500°C and about 1650°C.
3. The method according to claim 1 or claim 2 wherein the metal based composite is held at a temperature of between 1500°C and 1650°C for a time of between about 0.5 hours and about 10 hours.
4. The method according to any one of the previous claims wherein the component increases in size to between about 15 µm and about 100 µm.
5. The method according to any one of the previous claims wherein the metal based composite is a metal matrix composite made up of at least two components where one is a metal.
6. The method according to any one of the previous claims wherein the metal is titanium, yttrium or copper.
7. The method according to any one of the previous claims wherein the metal based composite is a combination of a metallic base and a reinforcing non-metallic component.
8. The method according to claim 7 wherein the non-metallic component is a ceramic material.
9. The method according to any one of the previous claims wherein the metal based composite is a metal-ceramic composite where the major component makes up greater than about 50% of the composite.

replaced  
by Article 34